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Shoe Bottom for Sport Shoes

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Description

The invention concerns a shoe bottom, especially for sport shoes, having an impact damping insole in accord with the principal concept of claim 1.

Made known by DE-OS 40 35 416, are sport shoes of this kind with one sole layer which, counter to the conventionally found injection molded sole layers based on foamed plastic as a raw material, have a structure which is hollow in design, and made from a relatively hard, but flexible plastic. In the matter of raw materials, a hard, workable plastic, for instance, polyamide or polyurethane with relatively thin wall thickness (1 to 2 mm) is applied, which forms support walls for the insole. The springlike elasticity of such a sole construction, resembles that of a leaf spring, and is put to use in sport shoes for damping sudden impact force. In the case of known shoe bottoms, support walls run essentially in a longitudinal direction and form thereby a damping, carrying structure, by which, the weight of the shoe sole becomes negligible..

There is also a shoe bottom known, wherein an intermediate sole, made of material suitable for injection molding, usually foamed polyurethane, has a spring inset in the heel area. This is shaped by a cylindrical shell of flat, oval cross-section. This spring is embedded in the said intermediate sole, in such a manner, that the effects of the cylindrical shell are directed transversely to the longitudinal axis of the sole. Furthermore, the said cylindrical shell remains open to the edges of the intermediate sole. The spring consists of a material of high tensile strength, for example, it can be made of a suitable plastic reinforced with carbon, kevlar, or glass fibers, which lends to the material a high degree of bending capability (EP-OS 359-421).

Besides the above, another shoe bottom is known, (DE-OS 34 40 206) wherein a plurality of transversely running pairs of ribs are placed between an upper and a lower insole. The ribs of each rib-pair are set counter to one another in their curvature to the front and back, or they are angled, and located at such a distance from one another, that, upon vertical loading, they are immediately freely spatially changed. However, as soon as the said ribs come in contact with each other, they are mutually supportive.

The insoles accompanying the said one-piece rib-pairs are made of a rubberlike material or a similar substance.

The purpose of the invention is to create a shoe bottom of the kind described in the opening passages, made from a springlike, deformable plastic, which, although possessing a good capability of damping, also exhibits a very light weight.

In accord with the invention, this purpose is achieved by the features in accord with the characterizations of the claim 1.

By means of the connection of an insole with the ground contacting, hollow, support shell, which forms the shoe bottom, an elastically deformable hollow structure has been made, wherewith the foot can support itself flat on an insole with a uniform apportionment of force. At the same time, by means of outward bulging of the ground contacting support shell, there is present in the areas of the forward sole and the heel, ground contact areas of relatively small dimensions. These said areas elastically deform themselves in response to the occurring reaction forces. The treading forces produce, essentially, a bending deformation of the supporting shell, the magnitude of which can be predetermined by the modulus of elasticity, the thickness of the walls and the amount of curvature of the selected materials of construction. The support shell, in the longitudinal direction of the shoe, is curved, or bulged convexly downward, but is laid out in the transverse direction without such curvature. The forces of the impact of stepping produce, essentially, a bending deformation of the support shell, the size of which can be predetermined by the modulus of elasticity, the thickness of the wall and the radius of curvature of the involved material. The support shell, in its longitudinal sole direction, is convexly curved or bulged downward, however, it does exhibit, in its transverse direction predominately straight line fabrications. Beyond this, the support shell in the arch area is open upward, so that when a step is taken, and in consequence of the roll-process, only the bulges in the heel area and in the forward sole zone make contact with the ground. Thereby, during the rolling procedure, the mentioned ground contact points migrate along the support shell in a forward direction. While this goes on, the said ground contact points are subjected to a constant elastic deformation, and as a result, act as a damping measure over the entire rolling procedure.

In accord with an advantageous formation, the support shell is constructed of a heel area and a fore-sole shell which, at the upward fashioned section at the arch area, binds itself with the underside of the insole and/or is directly connected thereto.

In the course of appropriate design of the wall thicknesses of the support shell, the said thicknesses absorb the loadings which occur because of the described elastic deformation and do so without additional damping elements being necessary. The weight of the shoe bottom, meanwhile, has become negligible and can be disregarded. Further, the emphasized bulging of the said support shell in the forward sole zone and in the heel areas can be either lightly damping bodies of a compressible material, or advantageously, tie bars made of a bendable elastic material. This is done for the reason, that a desirable distribution of force is thereby achieved, which at the same time allows the possibility of a reduction of the wall thickness of the entire support shell.

In the arch area, because of the upward lifted support shell localized at that point, and the small amount of rigidity which is caused thereby, the insole exhibits an emphasized resilience to torsion about the longitudinal axis in the direction of the sole. This torsion relaxation can also be supported by a predominant lessening of the width of the insole in the aid arch area.

Further advantages and features of the invention arise from the following description of embodiments, with the aid of the attached drawings as well as by additional subordinate claims. There is shown in the drawings:

Fig. 1 a perspective profile view of the of a first embodiment of the invented shoe bottom,

Fig. 2 an analogous presentation of a modified embodiment, and

Fig. 3 a top view, which presents the boundary limits of the shoe bottom

The shoe bottom which is presented in Fig. 1, possesses, instead of an intermediate sole, a hollow structure, which consists of a insole 1 and, situated below said insole at a predetermined distance, a support shell 2, . The insole 1 and the support shell 2, form a one-piece unit, wherein the insole 1 closes a plane angle with the support shell at the

point of the toe 3. At the opposite end, the insole 1 and the support shell 2 again meet in a sharp rounding juncture in the the heel structure 4. The support shell 2 is composed of forward sole shell 5 combined with a heel shell 6, which are both convexly bulged downward. Accordingly, the crown line of the bulge of the forward sole shell 5 positions itself to coincide with the line of the ball of the foot, or slightly back of this. The corresponding crown line of the heel shell lies under the impact pad of the heel. In a transverse direction the support shell 2 shows no bulging, or in some cases only a slight curvature or bulging. In other words, its transverse constructions are essentially straight line in nature, and give the forward sole shell and the heel shell respectively the shape of a partial cylinder cover, which, however, in no case must be in the form of a circular cylinder, but rather, this may possess a deviate cross-sectional form. In the arch area G is found the heel shell, which is here somewhat flat, and which joins itself to the underside of the insole 1, while the forward sole shell 5 is already bound thereto. The entire unit is made of a hard, although elastically bendable and deformable raw material, namely, from hard, but workable polyamide or polyurethane and is, if necessary, further reinforced in the longitudinal sole direction with high tensile strength fibers, such as carbon, Kevlar or glass fibers.

The insole 1 can lie flat, however, advantageously in the area of the forward part and the heel impact surface, the insole can very well be bulged or rounded, in order to achieve an optimal foot bedding action. On the underside of the forward sole shell 5 and the heel shell 6 is to be found a coating 7, 8 of an abrasion resistant material, namely, rubber. This abrasion coating 7, 8 is affixed to the sole bottom by adhesives or by vulcanization. If desired, this abrasion coating 7, 8 can also be profiled for non-slip characteristics.

As a result of the curvature of the forward sole shell and the heel shell, which holds the arch part G out of ground contact, it is possible to diminish the said rubber coated areas of 7, 8 onto the underside of the respective shells.

By an appropriate choice of the wall thickness, especially concerning the forward sole shell 5 and the heel shell 6, it becomes possible to retain the required damping capabilities and sufficient structural strength for the insole 1. Because of the weight

reduction, however, in Fig. 1 it becomes advisable to install a bracing of the forward sole shell 5 and the heel shell 6 respectively onto the insole 1 by means of providing a pair of transversely running ribs 11, 12 and 13, 14. Such reinforcement assures, that the wall thickness, especially the support shell 2, can be diminished in size, without incurring a lessening of structural strength. Beyond this, it is also a possibility, to more advantageously control the molding operation by means of a rolling process. The ribs 11, 12 and 13, 14 are again of constructed as one piece with an entire innersole unit and take on the shape of a partial cylinder shell, with respective curvatures running counter to one-another. Thereby, the said ribs, upon being subjected to vertical forces are loaded to crimping and suffer an elastic bending deformation in that direction which is predetermined by the direction of the said curvatures. Between the two ribs 11, 12 of the forward sole 5, the latter is provided with two transversely running corrugations 15, 16, in which area, the shell wall thickness can be reduced. These corrugations form resilient zones, which, by the rolling action ease a bending of the local part of the forward sole shell 5 and ease the forward sole section of the insole 1. The corrugations 15, 16 can have a depth of up to 10 mm.

The shoe bottom in accord with Fig. 2 differentiates itself from that of Fig. 1, only in that, as constructed, the support struts, formed by the ribs 11, 12 and 13, 14 are absent. Instead of these, there has been inserted damping bodies 18, 19 between the insole 1 and the support shell 2, which bodies are made of a pressure deformable material, such as polyurethane. The damping bodies 18, 19 extend themselves over an length of first, the forward sole shell 5, and second over the length of the heel shell 6. These lengths of extension correspond to the respective separating distances between the ribs 11 and 12 and the ribs 13 and 14. The described damping bodies are limited in extent by means of the ridges 20, 21, which run in a transverse direction before and after the damping bodies. This limitation prevents the said damping bodies from sliding out of position. Also, the possibility exists, that the damping bodies 18, 19 can be held in place by an adhesive. In the illustrated embodiment example, in accord with Fig. 2, the damping bodies 18, 19 are, respectively, longitudinally installed in a plane which approaches being parallel to the insole 1. The surfaces thereof, which are turned toward one another, each carry a plate

18c, 19c of a hart material, which forms a sliding path in the longitudinal direction of the sole. By means of this, a debilitating, reactive deformation of the forward sole shell 5 and of the heel shell 6, is prevented, as long as these damping bodies remain in their longitudinal confinement of the sole.

Fig. 3 provides the information, that the shell is considerably raised at the arch area of the two longitudinal sole edges. Further, at that location, the shoe bottom has considerably less width than it has in the forward sole area and in the heel area. This formulation makes possible, with the ad of small height of the structure in the arch area G, a pronounced torsional resilience about the axis of the sole.

As has been already been mentioned, the forward sole shells 5 and the heel shell 6 are only lightly bulged in the transverse direction, or even not bulged at all in this direction. It is worthy of consideration, that both shells can be slightly chamfered next to their edges, or, indeed, provided with a tapered rim at the edges, in order to avoid a sharp rim and especially to have an angular set-off in the heel area, but without causing an overload on said edges. Further, it is also possible to provide a closed, edged perforation in the forward sole shell 5 and/or in the heel shell 6, so that thereby, both shells receive a rig shaped tread surface. If necessary, or if desired, transverse running support struts such as the ribs (11, 12; 13, 14) or the damping bodies 18, 19 can either run continuously or even be taken away from the area of this said perforation, so that, at that place the under side of the insole 1 is lies fully free.

The embodiment, or unit, which has been described above and presented in the drawings, which is extended on the underside by a profiled abrasive layer 7, 8, forms in this shape, a shoe bottom, which, in a customary manner, can be bound to a shoe upper, possibly by means of adhesive. The upper can also possess additional inner sole or soles, which, in this case, would become an integral part of the shoe bottom.

Shoe Bottom
for Sport Shoes

Claims

Claimed is:

1. A shoe bottom, especially for sport shoes, with an impact damping sole layer, which said shoe bottom is made from a hollow structure of a relative hard, spring-like elastic, bendable material, therein characterized, in that the hollow structure forming the impact damping sole layer of a relative hard, spring-like elastic, bendable material includes an insole (1) with a support shell (2) located thereunder at a predetermined distance, which is connected with the insole (1) at the front tip (3) thereof and is further connected in the heel bulge apex area (4) and further, in the area of the forward sole (5) is convexly bulged downward as well as being so bulged in the heel area (6) in the longitudinal direction of the sole.

2. A shoe bottom in accord with claim 1, therein characterized, in that the support shell (2) encompasses a forward sole shell (5) and a heel shell (6), which, in the area of the arch (G) are bound to one another and are further bound to the under side of the insole (1).

3. A shoe bottom in accord with claim 1 or 2, therein characterized, in that, respectively in the area of the forward sole and in the heel area between the insole (1) and the support shell (2), a damping body (18, 19) of a elastically compressible material is placed.

4. A shoe bottom in accord with claim 1 or 2, therein characterized, in that, respectively, in the area of the forward sole and in the heel area in between the insole (1) and the support shell (2), one or more reinforcement struts (11, 12; 13, 14) are placed.

5. A shoe bottom in accord with claim 4, therein characterized, in that, the reinforcement struts (11, 12; 13, 14) are ribs which run transversely across the breadth of the sole layer.

6. A shoe bottom in accord with claim 5, therein characterized, in that the ribs approach the shape of partial cylindrical shells, the axes of which run somewhat parallel to the products of the forward sole shell (5) and the heel shell (6).

7. A shoe bottom in accord with claim 6, therein characterized, in that the ribs are curved in a manner contrary to one another.

8. A shoe bottom in accord with one of the claims 2 to 7, therein characterized, in that the forward sole shell (5) possesses transverse running bending zones (15, 16).

9. A shoe bottom in accord with claim 8, therein characterized, in that the bending zones (15, 16) are shaped under the ball of the foot zones by means of corrugation-like indentation in the forward sole shell (5).

10. A shoe bottom in accord with claim 8 or 9, therein characterized in that the bending zones are placed between a pair of support struts (11, 12).

* * *

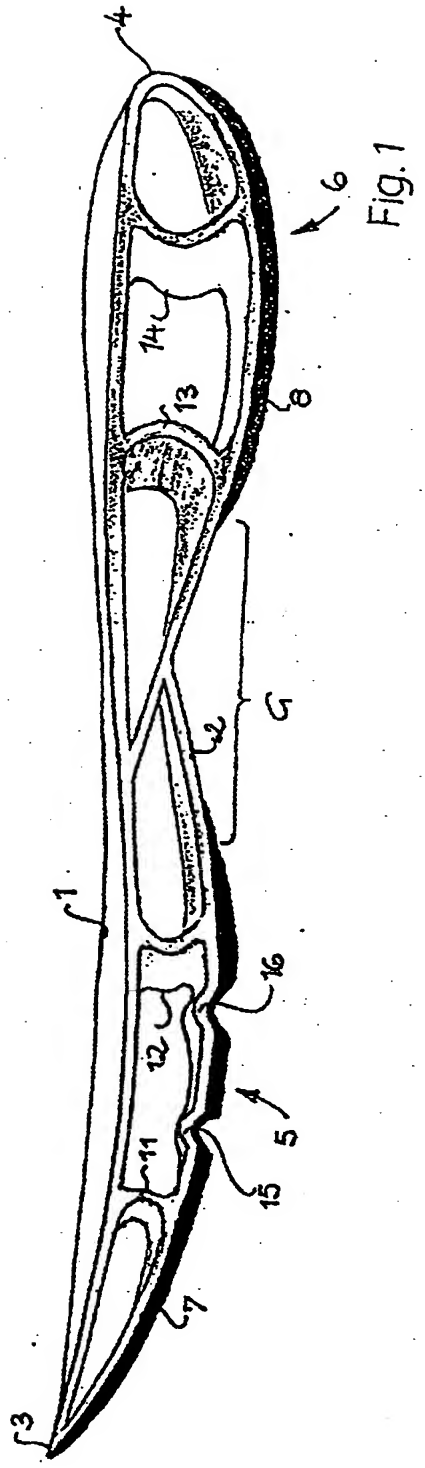

Fig.1

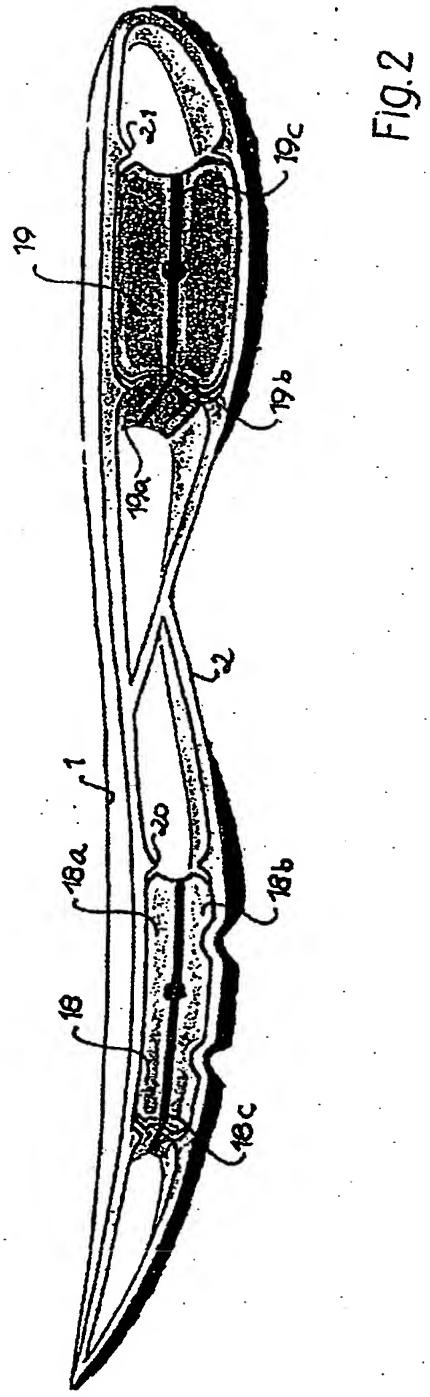

Fig.2

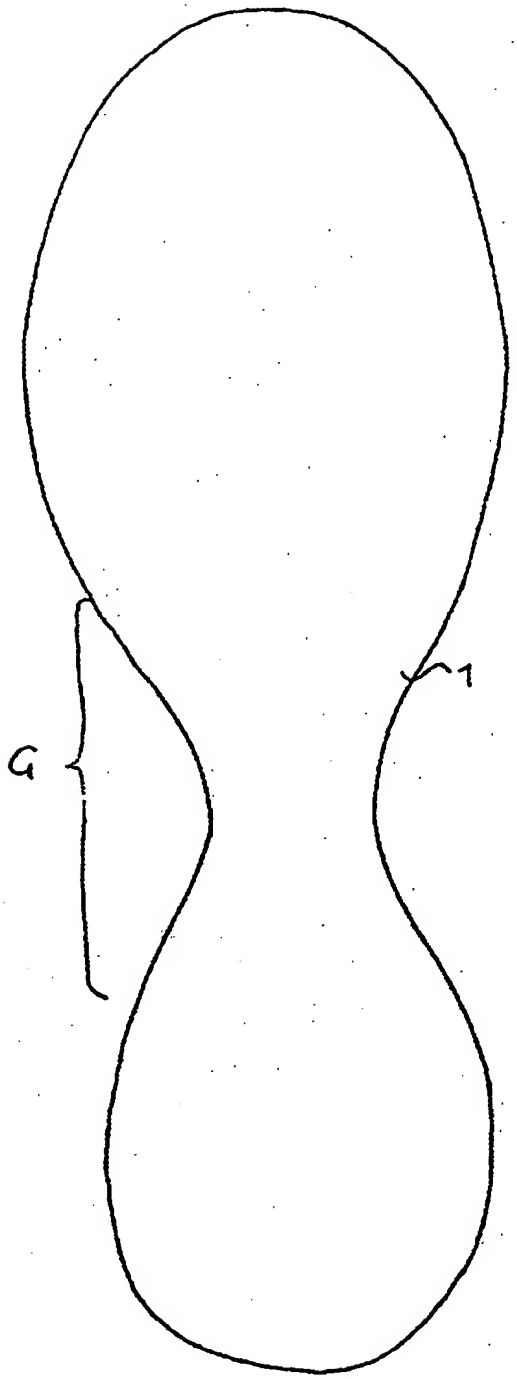

Fig.3